REMARKS

Claims 1-20 remain in this application, and are not amended by this response.

Claims 1, 3-6, 8-11, 13-16 and 18-20 were rejected under 35 U.S.C. § 102(b) as being anticipated by Kunii. These rejections are respectfully traversed.

Kunii discloses a method for analyzing and displaying motions of a human being or animal in which captured motion is analyzed using inverse dynamics to calculate forces and torques exerted on each joint. Abstract; fig. 1; col. 5:26-29; col. 7:23-31. The resulting force data may be displayed, including net forces acting on the center of mass. Col. 7:32-38. For example, resulting forces on a pair of martial artists may be displayed using arrows. Col. 7:50-60; fig. 5. The force/torque data is stored in a database. Col. 5:29-31. This force data results from an inverse dynamics analysis of an articulated figure, and therefore reads on the inverse-dynamics solution F(t) defined by claims 1 and 11. The stored force/torque data is manually altered by an analyst, and the altered data applied using forward dynamics to model a new motion. Col. 5:38-41; col. 8:45-9:13. Constraints are applied to the resulting motion, and inverse dynamics applied again to determine the internal force/torque values. Col. 10:20-49. The cycle of manually modifying the internal forces, running the forward dynamics, applying constraints, and checking the resulting forces for the constrained motion is iterated until "desired results" are obtained. Col. 10:59-61. In a nutshell, Kunii discloses modifying F(t) to model new motions, but fails to disclose accessing external force data G(t), or simulating response of an articulated figure to a sum of F(t) and G(t).

Kunii is primarily concerned with motion analysis and skill training. Col. 5:2-4; 23-25. In contrast, the present application is concerned with the different problem of animation production for entertainment purposes. Spec., p. 4:14-16. While making use of some of the same tools of dynamics and modeling as the present application, Kunii discloses a different process than claimed.

Kunii fails to disclose or suggest:

> accessing force data *G(t)*, wherein *G(t)* comprises external force values for simulating a response of the articulated figure; and
>
> providing a sum of *F(t)* and *G(t)* suitable for input in simulating a dynamic response of the articulated figure using a forward-dynamics motion simulation to determine a simulated pose sequence *P(t)*

as defined by claims 1 and 11. The Office Action recites col. 8:39-44 as disclosing accessing external force data *G(t)*. This is not factually correct. Kunii discloses displaying a vector of forces exerted on the center of gravity of bodies, superimposed on a model of filmed persons. Col. 8:39-44. These displayed forces are calculated using inverse dynamics analysis of motion capture data captured for the depicted persons. Col. 8:23-31. Because the force vectors shown in fig. 5 of Kunii are determined from inverse dynamics analysis of motion capture data, they are not, despite superficial appearances, applied external forces. These depicted forces represent what, given the motion capture data, is acting on each body as determined by the inverse dynamics analysis. *Id.*

Kunii therefore fails to disclose accessing external force data that comprises values *for simulating a response of the articulated figure*, as claimed. This external force data, comprising values for simulating a response of the articulated figure, cannot be the same as forces resulting from inverse dynamic analysis of captured motion, depicted in Fig. 5 of Kunii. The specification provides examples of the claimed forces for simulating a response as arising from collisions, such as used in prior-art "rag-doll" modeling. Spec., page 1, lines 13-25; page 2, lines 1-9; see also page 5, lines 15-22. The force data *G(t),* as disclosed in the specification and defined by the claims, is pre-existing and, unlike Kunii, does not result from an inverse dynamics analysis of captured motion data. Spec., page 14, lines 7-18. Claims 1 and 11 separately define F(t) as an inverse-dynamics solution in contrast to G(t), defined as external force values for simulating a response of the articulated figure. Therefore, according to claims 1 and 11, F(t) and G(t) are separate quantities.

In addition, claims 1 and 11 further define simulating a dynamic response of the articulated figure to a sum of F(t) and G(t). Kunii fails to disclose providing a sum of the reverse-dynamics solution *F(t)* and the external force data *G(t)* to provide data suitable for input to a forward-dynamics motion simulation. The Office Action cites Kunii at col. 9:3-7 as disclosing simulating a dynamic response of an articulated figure to a sum of *F(t)* and *G(t)*. This, too, is factually incorrect.

At col. 9:3-7, Kunii discloses for its eighth step calculating the motion of each body segment using the modified internal joint forces, i.e., modified forces reading on the claimed F(t). Kunii fails to disclose summing these forces with external forces. Kunii discloses that these forces applied in the eighth step are modified internal joint forces, that is, "all the forces on each joint over time." Col. 8:35-65. These forces are scaled globally or locally to simulate a modified response of the articulated figure. *Id.,* col. 9:3-7. After simulating the response to the modified internal forces, Kunii discloses that limits are applied and then another inverse dynamics calculation is performed to check internal forces, and the process is iterated to achieve "desired results," as noted above. Overall, the method of Kunii is "particularly useful in analyzing and teaching sports motions." Col. 11:57-62.

Therefore, Kunii merely discloses modifying internal joint forces and applying the modified forces in an iterative manner to model new motions. Kunii utterly fails to disclose summing an inverse-dynamics solution *F(t)* with external force data *G(t)* to provide data suitable for input to a forward-dynamics simulation, as claims 1 and 11 define.

Failing to disclose or suggest all of the claimed elements of claims 1 and 11, Kunii therefore cannot anticipate these claims under § 102. The remaining rejected claims are also allowable, at least as depending from allowable base claims.

Further with respect to claims 8 and 18, Delp fails to disclose calculating *G(t)* using *P(t)* as input to determine collision events, whereby impulse values for *G(t)* are calculated. The Office Action erroneously cites the display of results from forward

dynamics analysis as shown in fig. 5 and accompanying discussion at col. 7:50-60 as disclosing this element. In fact, fig. 5 of Kunii depicts forces on a center of gravity calculated from inverse dynamics: "the data as to motions input in the second step are analyzed using inverse dynamics." Col. 7:23-27. As noted above, these forces resulting from inverse dynamics may be comparable to the claimed forces F(t), but not to external forces G(t). Kunii discloses that inverse dynamics is applied to determine the forces depicted in fig. 5: "The center of gravity of each of the body segments, the force and torque exerted on each joint, the positions of the center of gravity of the whole body and the forces and torques exerted on the centers of gravity are all calculated." Kunii nowhere discloses determining collision events from an analysis of the motion data P(t), nor does Kunii disclose calculating impulse values for G(t) from the determination of collision events. Because Kunii fails to expressly or inherently disclose the claimed step, it cannot anticipate claims 8 and 18, which are therefore independently allowable.

With respect to claims 9 and 20, Kunii fails to disclose or suggest performing the calculation of F(t) and simulation of motion concurrently. The Office Action's citation of Kunii at col. 10:40-58 is not correct. Kunii there discloses its "tenth step" of determining F(t) again using inverse dynamics, after intermediate steps of forwards dynamics using a modified F(t) to obtain a motion sequence, and application of limits to the resulting motion. *See, e.g.*, fig. 1; Kunii's tenth step corresponds to the box labeled "applying inverse dynamics." Being performed *before* the resulting motion is simulated to display a result, the calculation of joint forces is therefore *not* concurrent with it. In contrast, claims 9 and 20 define a concurrent performance of these steps, such as described in the specification at page 12:24 to 13:12. Kunii fails to disclose any such process in which the calculation of internal forces using inverse dynamics, and simulation of a pose sequence are performed concurrently. Failing to disclose the claimed feature, Kunii does not anticipate claims 9 and 20, which are therefore independently allowable.

Claims 2, 7, 12 and 17 were rejected under 35 U.S.C. § 103(a) as unpatentable over Kunii. These rejections are respectfully traversed. As shown above, Kunii fails to disclose or suggest all elements of the respective base claims 1 and 11. Hence, these claims are allowable, at least as depending from allowable base claims.

In addition, there has been no showing that "setting Δt equal to a user-determinable value," as defined by claims 2 and 12, was known in the art. While acknowledging that Kunii fails to disclose this step, the Office Action merely argues that it would have been obvious to perform it, without citing any other reference or taking official notice that the step was know in the art. Thus, no proper *prima facie* case of obviousness has been made out against claims 2 and 12. Applicants therefore respectfully request that a reference be provided showing the claimed feature, or this rejection be withdrawn.

Likewise, with respect to claims 7 and 17, there has been no showing that any reference discloses the claimed feature "scaling *F(t)* by *s,* wherein *s* comprises a time-dependent function." Instead, in paragraph 16 of the Office Action, it is merely argued that it would have been obvious to do so. However, demonstrating obviousness under 35 U.S.C. § 103(a) requires that the prior art references teach or suggest all the claim limitations. M.P.E.P. § 2143. This has not been shown. These rejections should therefore be withdrawn.

In view of the foregoing, the Applicants respectfully submit that Claims 1-20 are in condition for allowance. Reconsideration and withdrawal of the rejections is respectfully requested, and a timely Notice of Allowability is solicited.

To the extent it would be helpful to placing this application in condition for allowance, the Applicants encourage the Examiner to contact the undersigned counsel and conduct a telephonic interview.

To the extent necessary, Applicants petition the Commissioner for a one-month extension of time, extending to November 6, 2007 the period for response to the Office Action dated July 6, 2007. The Commissioner is authorized to charge any fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 50-3683.

Respectfully submitted,

Date: November 6, 2007

/Jonathan Jaech/
Jonathan Jaech
Attorney for Applicants
Registration No. 41,091

CUSTOMER NUMBER

58688
PATENT TRADEMARK OFFICE

Connolly Bove Lodge & Hutz LLP
1007 N. Orange Street
P. O. Box 2207
Wilmington, Delaware 19899
(213) 787-2500